

In the DESCRIPTION:

Please replace the paragraph beginning at page 6, line 5, with the following rewritten paragraph:

Figure 2 is an isometric view of the top portion of viscometer 80 with main shaft 56 hidden for clarity. In Fig. 2, an arm 70 is screwed onto the side wall of bob shaft 10. A fiberoptic displacement sensor assembly 12 is mounted on the side wall of main shaft 56. Fiberoptic displacement sensor assembly 12 consists of a mounting fitting, a stainless steel tubing shield, a transparent sapphire window in front of the tubing shield and a bare fiberoptic displacement sensor inside of the tubing shield. ~~This fiberoptic displacement sensor assembly 12 is commercially available from Philtec Inc., Arnold, MD. Preferred model is D-63W. The operation theory of a fiberoptic displacement sensor is not in the scope of this invention and is readily available on Philtec Inc. web sites.~~ The stainless steel tubing shield and the Sapphire window of fiberoptic displacement sensor assembly 12 separate the electronic and fragile portions of the sensor from pressurized zone, and prevent possible overload and corrosive damages to them as well.

REMARKS – General

The specification has been amended editorially and to eliminate unnecessary restriction on current invention.

Claims 1 and 2 have been amended. Claims 3-13 have been kept the same.

Claims 1 and 2 have been amended for the following reason:

To define the invention more particularly and distinctly so as to overcome the technical rejections.

Amendment According To O.A. Page 2, Point 1 - The Objection to Claim 1

Claims 1 is modified so that current claim 1 only contains one period.

The Rejection of Claim 1-9 on US 4,571,988 (Murphy Jr.) in view of US 5,535,619 (Brookfield) Is Overcome

The last O.A. page 2, point 3 rejected claims 1 on US 4,571,988 (Murphy Jr.) in view of US 5,535,619 (Brookfield). Applicant requests reconsideration of this rejection, as now applicable to amended claims 1-9, for the following reasons:

- (1) Murphy Jr. does not disclose means for suspending the bob including: at least two axially disposed sleeves and one or more leaf springs that hold the sleeves together at least some of the leaf springs have their two ends connected to two different the sleeves. Item 96 in US 4,571,988 (Murphy Jr.) mentioned on last O.A. page 3, line 1, is “a concentric drive sleeve 96 for imparting rotation to the sleeves 76 and 70” (Column 5, line 21-23). Also, “in the illustrated embodiment, the drive sleeve 96 includes sprockets 98 located about its periphery for cooperation with a chain 100 passing through an opening 86 in the sleeve support 80 of the stationary frame” (Column 5, line 25-29). Thus item 96 belongs to part of “means for rotating said sleeves” (Claim 1) in Murphy Jr. instead of part of suspension of the cylindrical

bob. So item 96 in Murphy Jr. is functionally equivalent to the upper portion of item 28 in current application.

- (2) Item 76 in US 4,571,988 (Murphy Jr.) mentioned on last O.A. page 3, line 1, is functionally equivalent to item 28 (rotor) instead of suspending the bob in current invention. "The illustrated rheometer 10 further includes a tubular sleeve comprised of a lower sleeve 70 threadedly attached to an upper sleeve 76 which in turn is threadedly attached near its upper end to an annular support collar 78" (Column 5, line 12-16). Thus item 70 in Murphy Jr. serves the same purpose as item 42 in current application. Both of them surround a bob while rotating. Item 76 in Murphy Jr. connects to item 70 in Murphy Jr. threadedly, and this is same as item 28 in current application connects to item 42 in current application threadedly.
- (3) The sleeves in Murphy Jr. that mentioned in last O.A. page 3 line 6-7 are functionally equivalent to (a) a rotor which is driven to rotate while contacting with a sample liquid to be measured in claim 1 of current application. Please also see above (1) and (2).
- (4) The spring clip in Brookfield that mentioned in last O.A. page 3 line 9-11 is functionally equivalent to thread 45 in current application. They both attach a bob to a bob shaft. "The torsion assembly has three rods TR as in state-of-the-art TT brand instruments (Brookfield Engineering Laboratories, Inc.). A sealing bube SW, sealed into assembly 45 at 45-1, surrounds the read-out wire 40" (Column 3 line 7-10). Thus the torsion assembly in Brookfield is equivalent to (e) means for suspending said bob in claim 1 of current application. However, Brookfield does not disclose any sleeves held together by leaf spring.
- (5) The sleeves held together by leaf spring in current invention functions much better than the flexural bearing in Murphy Jr. while can be installed much easier. In Murphy Jr., "When the angle of rotation is restricted to less than about two degrees, the intersection 30 of the strips 22, 24 will not be appreciably shifted from the center of rotation A and the spring may be employed in an accurate force or torque measuring device" (Column 4, line 36-40). However, the relative rotation of sleeves held by leaf springs in current invention is inherently self-centering. Also the sleeves held together by leaf spring in current invention can undertake much more overload comparing to the flexural bearing in Murphy Jr.

Additionally, the sleeves held together by leaf spring in the current invention can be installed very conveniently by inserting into a bore hole, while the flexural bearing in Murphy Jr. is very difficult and complex to install with good alignment. Finally, the assembly that suspends the bob in Murphy Jr. is much more expensive to manufacture than the sleeves in current application because it involves many mechanical parts with complex geometry and tight tolerance.

- (6) US 4,571,988 (Murphy Jr.) is never commercially available while M5500 rheometer from Grace Instrument Company manufactured according to the principle of current application is commercially very successful.
- (7) Neither US patent 4,571,988 nor US patent 5,535,619 contains any suggestion (express or implied) that they can be combined, or that they can be combined in the manner suggested.
- (8) Each invention from US patent 4,571,988 nor US patent 5,535,619 is complete and functional in itself, so there would be no reason to use parts from or add or substitute parts to any one.
- (9) Regarding claim 2, item 96 and item 76 in Murphy Jr. are not for suspending the bob. Please also see above (1), (2) and (3).
- (10) Regarding claim 3, item 96 and item 76 in Murphy Jr. are not for suspending the bob. Please also see above (1), (2) and (3).
- (11) Regarding claim 4, item 70 and item 76 in Murphy Jr. are not for suspending the bob. Please also see above (1), (2) and (3).
- (12) Regarding claim 5, the two coaxial sleeves in Murphy Jr. are not for suspending the bob. Please also see above (1), (2) and (3).
- (13) Regarding claim 6, the two coaxial sleeves are held together threadedly and they do not have angular displacement relative to each other. Please also see above (1), (2) and (3).
- (14) Because claim 8 is based on claim 1, so claim 8 should be patentable if claim 1 is so.
- (15) Because claim 9 is based on claim 1, so claim 9 should be patentable if claim 1 is so.

The Rejection of Claim 7 on US 4,571,988 (Murphy Jr.), US 5,535,619 (Brookfield) and In Further View of US 5,763,766 (Robinson) Is Overcome

The last O.A. page 4, point 4 rejected claims 7 on Murphy Jr., Brookfield and in further view of Robinson. Applicant requests reconsideration of this rejection for the following reasons:

- (1) Neither Murphy Jr. nor Robinson contains any suggestion (express or implied) that they can be combined, or that they can be combined in the manner suggested.
- (2) Each invention from US patent 4,571,988 nor US patent 5,763,766 is complete and functional in itself, so there would be no reason to use parts from or add or substitute parts to any one.
- (3) Because claim 7 is based on claim 1, so claim 7 should be patentable if claim 1 is so.
- (4) It is impossible to combine Robinson with Murphy Jr. Robinson uses a torsion wire to suspend a bob while Murphy Jr. uses a flexural bearing to suspend a bob. It is not reasonable to suspend a bob simultaneously with a torsion wire and a flexural bearing.
- (5) Even if combined, the references would not generate a means that consists of two or more sleeves held together by leaf springs.
- (6) The references themselves teach away from the suggested combination. In Robinson claim 1, "an elongated support wire connected to said housing in at least two mounting points", this prevents the usage of flexural bearing or sleeves held together by leaf spring to suspend a bob.

The Rejection of Claim 10 on US 4,571,988 (Murphy Jr.), US 5,535,619 (Brookfield) and In Further View of US 4,077,252 (Stutz et al.) Is Overcome

The last O.A. page 4, point 5 rejected claims 10 on Murphy Jr., Brookfield and in further view of Stutz et al. Applicant requests reconsideration of this rejection for the following reasons:

- (1) Neither Murphy Jr. nor Stutz et al. contains any suggestion (express or implied) that they can be combined, or that they can be combined in the manner suggested.
- (2) Each invention from US patent 4,571,988 nor US patent 4,077,252 is complete and functional in itself, so there would be no reason to use parts from or add or substitute parts to any one.
- (3) Because claim 10 is based on claim 1, so claim 10 should be patentable if claim 1 is so.

- (4) Item 11, 12 and 20 in Stutz et al. consists of a synchronous motor, and rotor 20 constantly rotates. The item 11, 12 and 20 themselves have nothing to do with sensing the rotation of the bob because the bob in Stutz et al. rotates with rotor 20 continuously. This is totally different from Murphy Jr. and current application, in which their bobs are suspended so that they can only perform limited angular movement, not rotate constantly.
- (5) In Stutz et al., an angle measuring-apparatus 70, is used to measure the drag applied to the bob due to fluid viscosity. The angle measuring-apparatus 70 in Stutz et al. works under opto-electrical principal. So it is totally different from a pair of electrical stator and rotor.
- (6) It is impossible to combine Stutz et al. with Murphy Jr. In Murphy Jr. invention, bob can not rotate continuously.

The Rejection of Claim 11 on US 4,571,988 (Murphy Jr.), US 5,535,619 (Brookfield) and In Further View of US 2,484,761 (Stock) Is Overcome

The last O.A. page 5, point 6 rejected claims 11 on Murphy Jr., Brookfield and in further view of Stock. Applicant requests reconsideration of this rejection for the following reasons:

- (1) Because claim 11 is based on claim 1, so claim 11 should be patentable if claim 1 is so.
- (2) Murphy Jr. and Stock take different approaches to measure the torque applied to bobs. Murphy Jr. measures the angular deflection of flexural bearing, while stock measures the deformation of supporting beams. So it is not obvious to combine them if it is possible.
- (3) Even if Murphy Jr. and Stock are combined, nothing like sleeves held together by leaf spring will be created.

The Rejection of Claim 12 and 13 Is Overcome

The last O.A. page 6, point 7 rejected claims 12 and 13 as being dependent upon a rejected base claim. Applicant requests reconsideration of this rejection for the following reasons:

- (1) Because claim 12 and 13 is based on claim 1, so claim 12 and 13 should be patentable if claim 1 is so.
- (2) The commercial success of this invention also proved the novelty of this invention. Grace Instrument Company has been manufacturing model M5500 viscometer according to the

invention in this application. In a very short period of time, M5500 viscometer has been sold to almost every single large oil service and petroleum companies, including Exxon/Mobil, Shell, Halliburton, Schlumberger, BJ Services, MI LLC. Please visit www.graceinstrument.com for more detailed customer list. The low maintenance, automation and durability of M5500 viscometer have made itself an extremely competitive product. A flier of this viscometer is also attached.

Conclusion

For all of the above reasons, applicant submits that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore applicant submit that this application is now in condition for allowance, which action applicant respectfully solicit.

Applicant respectfully requests that a timely Notice of Allowance be issued in the case.

Conditional Request For Constructive Assistance

Applicant has amended the specification and claims of this application so that they are proper, definite and define novel structure which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, applicant respectfully request the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

Hongfeng Bi

----- Applicant Pro Se -----

888 W Sam Houston Parkway, S

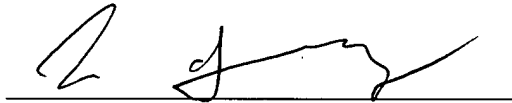
Suite 125

Houston, TX 77042

Tel (713)783-1560; Fax (713)974-7144

Certificate of Mailing: I certify that on the date below this document and referenced attachments, if any, will be deposited with the U.S. Postal Service as Express mail in an envelope addressed to "Box NON-FEE AMENDMENTS, HONORABLE COMMISSIONER FOR PATENTS, P.O. Box 1450, Alexandria, VA 22313-1450."

Dec 06, 2004

A handwritten signature in black ink, appearing to be 'Hongfeng Bi', written over a horizontal line.

Hongfeng Bi, Applicant